Tactical Control System (TCS)
Training Development and Management Plan

Prepared for:

Program Executive Officer, Cruise Missiles Project
and Unmanned Air Vehicles Joint Project

TCS Doc 704
Version 1.0

24 March 1998

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1.0 INTRODUCTION

This Training Development and Management Plan addresses the administration of the Unmanned Aerial Vehicle (UAV) Tactical Control System (TCS) Training Development project within the Program Executive Office for Cruise Missiles and Joint Unmanned Aerial Vehicles. It covers training and training development concepts, goals and objectives, a summary of the TCS Instructional Systems Development (ISD) process, pertinent actions and milestones, an outline of the management organization, quality assurance, configuration management, and special considerations.

1.1 Purpose

The TCS Training Development and Management Plan provides a single document which compiles pertinent information necessary for the management of the TCS Training Development project. The management plan is the guiding document for both the government and Training IPT to monitor program progress. It is a living document that will require updates to concepts, planned actions, and milestones, as required by the progress of the overall TCS Program. This plan outlines a basic Training Concept, and implementation options as a basis for the Training Development strategy.

1.2 Scope

The focus of the Training Development Plan is the development of a basic training program by the completion of Phase I and the validation and integration of that program into the existing service specific UAV training programs during Phase II. It is important to recognize that TCS training does not eliminate existing institutional training; it is a product that is integrated into those programs.

The TCS program is unique in that in order to meet training timelines, training development must progress in parallel with engineering development. This requires a unique approach to the development process that must exploit all existing training data to eliminate redundant analysis and uses an incremental evolutionary build - update production strategy to keep pace with software production but avoid constant reworking of instructional material. The overall strategy is to accomplish the majority of the Instructional Systems Development (ISD) at the point in the Phase I engineering program when a majority of the system is functionally stable. Small updates will then be made with successive Software/Engineering Builds. By defining design, establishing interface standards, and validating the training material early, the overall risk for training development will be significantly reduced. This strategy will deliver stable, validated, training software at the beginning of Phase II for incorporation into the LRIP systems, satisfy ORD and DT/OT training capability requirements, and support final decisions on additional formal and CBT training requirements and equipment.

1.3 Referenced Documents

1 Joint Operational Requirements Document for the Unmanned Aerial Vehicle Tactical

Control System, Version 5.0., July 7, 1997 (JROCM 001-97)

2 TCS Program Management Plan, Version 4.1, Aug. 6, 1997 (TCS 700)

3 TCS System/Subsystem Specification, Version 1.0, June 30, 1997 (TCS 103)

4 TCS System/Subsystem Design Description, Draft, Aug. 8, 1997 (TCS 104)

5 Configuration Management Plan for UAV TCS, Draft, Oct. 10, 1997 (TCS 701)

6 Joint Training System Plan for UAV Tactical Control System, Draft, January 27, 1998(TCS xxx)

2.0 TRAINING REQUIREMENTS

Table 1 translates TCS Operational Requirements, as defined in the TCS Operational Requirements Document (TCS ORD), into Training Development Requirements.

ORD REQUIREMENT	TRAINING DEVELOPMENT REQUIREMENT
Scope of Training	
• TCS is the software...necessary for the control of present and all future UAV's"	• TCS training will cover multi-UAV skills and knowledge.
• TCS will be capable of supporting additional software modules for controlling future payloads, payload capabilities, and future tactical UAVs	• TCS courseware will be designed to easily incorporate new vehicles and capabilities.
• Since not all recipients of UAV information require all levels of TCS capabilities, the software and software related hardware will be scaleable to meet users' needs. • TCS will support five levels of UAV interaction. (1) Level one is the receipt and transmission of secondary imagery and/or data. (2) Level two is the direct receipt of imagery and/or data. (3) Level three is the control of the UAV payload in addition to the direct receipt of imagery/data. (4) Level four is the control of the UAV, less launch and recovery, plus all the functions of level three. (5) Level five is the capability to have full function and control of the UAV from takeoff to landing.	• Training will be designed in modules such that training available is scaleable to the level of interaction achievable by the supported TCS configuration and/or operator qualification.
• The TCS shall enable the UAV operator to communicate, receive mission tasking, conduct mission planning, execute the mission, and collect, process, and disseminate data for the	• TCS training will cover, as a minimum, these functions as they are implemented and defined by the TCS operating system and Concept of Operations (CONOPS)

TUAV and MAE UAV, and support data collection from HAE UAV.	
Implementation of Training	
• Receiving units will receive new equipment training as the system is fielded. Instructor and key personnel training will be required.	• Initial training efforts will be focused on new equipment training covering introduction, initial implementation, and unit build-up • This training will be focused on developing an instructor cadre while maintaining operational capability in the field until institution and field units can stand alone.
• Training will be balanced between institutional, new equipment, and unit training.	• Sustainment training will encompass training at the institutional level and an In-service Training capability at the unit level.
Architecture and Design of Training	
• The software will provide a high resolution, computer generated graphical user interface that enables a UAV operator that is trained in one system to control different types of UAVs or UAV payloads with minimal additional training.	• Training architecture will leverage the capabilities of the "standardized" Human-Computer Interface (HCI) in order to efficiently teach multi-UAV capabilities. • UAV training will be developed to accommodate single UAV as well as multi-UAV operations.
• Unit training will be conducted in both garrison and field environments-individual and collective modes.	• Training architecture will accommodate portability/exportability to the field.
• The system will provide for the operator and maintainer, the capability for incorporation of embedded/add-on interactive training with self-paced instruction, duplicating flight performance characteristics, capabilities, and limitations.	• Training architecture will be focused around an Interactive Courseware (ICW) Program that will be independent but compatible with the TCS core software so that it can perform as a stand alone unit or be "embedded" as a non-real time functional element. • Training design will include the use of internal simulation capabilities
• The TUAV TCS system shall be compatible with the Multiple UAV Simulation Environment (MUSE) as an objective.	• Training design will take advantage of compatibility with external simulation systems.
• Receiving services are the U.S. Army, U.S. Marine Corps, U.S. Navy, U.S. Air Force. There is allied interest in this program.	• Training courseware will be developed in a joint format to allow for an easy and cost effective transition to meet individual service requirements and formats.
Training Equipment	
• Training devices will be required for the institutional training base.	• Equipment requirements to support institutional training will be determined

	through development analysis.

Table 1: TCS ORD AND TRAINING REQUIREMENTS

3.0 TRAINING CONCEPT

3.0 TCS Course Characteristics

TCS Training will be based on three courses; A TCS Core Course that will integrate into the existing Initial Qualification Training (IQT)/Replacement Operator training programs of the service specific training programs; a follow-on TCS Advanced Course to meet Operator qualification requirements for multi-UAV operations; a TCS Maintenance Course to meet requirements for O, I, and D level operations and maintenance applicable to TCS. The following are the basic characteristics of each courses:

(1) TCS Operator Core Course - basic system operation (menus, buttons, windows, etc.), for TCS interactivity levels 1-4, single-UAV operations. The Core Course is composed of the following TCS functions:

- System Initialization and Shutdown
- Route and Payload Planning
- Mission Control and Monitoring (including operational and emergency procedures)
- Payload Processing
- Fault Detection and Isolation
- C4I Systems Interfaces

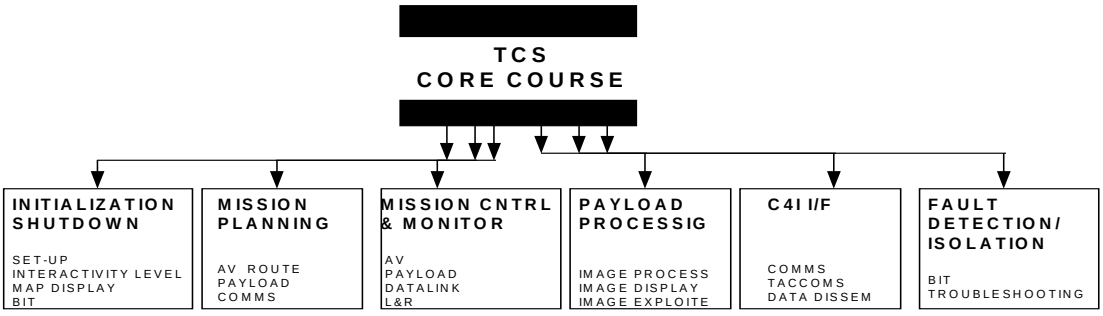


Figure 1: TCS CORE COURSE

(2) TCS Operator Advanced Course - follow-on training that covers TCS operations for qualification for TCS interactivity levels 3-5, multi-UAV. Based on service developed criteria selected operators would be given follow-on institutional training for qualification for TCS interactivity levels 3-5, multi-UAV operation. This leverages TCS Core training in TCS single-UAV operations for the expansion of skills and knowledge to control other TCS capable systems at the TCS levels 3-4 and specifically level 5 interactivity level. In any case, the normal and emergency operating procedures for the UAV system, and additional procedures necessitated by TCS hardware, will be addressed in the TCS Training development.

Currently, the functionality of levels 3-5 is being defined as well as the determination by the services of doctrine, personnel and qualification issues. This data is required before final development of the Advanced Course can be completed.

(3) TCS Maintenance Technician Course - The TCS Maintenance Technician Course will be specific for the different hardware suites of the individual services, but generic for all TCS unique items (DCM, etc.). The results of ongoing Logistics analyses will identify the maintenance requirements that integration of TCS adds to existing service/system requirements. That definition will identify training requirements and the design of required training through the ISD process.

The Operator Core and Advanced courses, and the Maintenance course will be designed in a modular format to allow the flexibility to group individual lessons or functional groupings of lessons to support curriculum variations and be easily assimilated into the existing training syllabi. Each of the courses could also be used as the core of an Instructor Training syllabus with the addition of service/system specific Instructor training elements.

3.1 Current Training Structure

UAV Operator and Maintenance IQT/ Replacement Operator training for the UAV systems that TCS is currently projected to support is taught by three separate training institutions:

SERVICE	UAV TYPE	INSTITUTION NAME	LOCATION
U.S. Army	TUAV (Outrider)	Joint UAV Training Center (JUAVTC)	Ft. Huachuca, AZ
U.S. Navy/Marine Corps	TUAV, Pioneer	Naval Training Group Detachment - FHU-Aviation Maintenance Training Unit 6001 (NTG)	Ft. Huachuca, AZ
U.S. Air Force	MAE UAV (Predator)	11th Reconnaissance Squadron (11th RS)	USAF-AF Indian Springs, NV

Table 2: INSTITUTIONAL TRAINING

3.1.1 Pioneer

Pioneer Ground Control Station Operator training is administered by NTG as a “common” course, i.e. all students go through the same course and are qualified for both the Internal Pilot and Payload Operator (IP/PO) crew positions. The syllabus requires approximately 8 weeks and is composed of ground and flight training courses. Training consists of the following:

- Academics
  - Crew Coordination
  - Ground Station operation
  - Air Vehicle operation
  - JUAVTOP familiarization

- Aerodynamics
- Meteorology
- Mission Planning
- Map Reading
- Emergency Procedures
- FAA Radio Procedures
- Support Equipment operation
- Payload operation

- Flights
  - IP Local Pattern flights: 3 flights/1.5 hrs each
  - IP Range flights: 10 flights/1.5 hrs each
  - PO flights: 8 flights/1.5 hrs each

All personnel with UAV specific MOS's and NEC's must have successfully completed the appropriate course of instruction at NTG. Upon completion, the trainee will complete tactical training at the local command in accordance with the current training manual and local directives.

Pioneer utilizes a External Pilot (EP) for takeoff, landing, and transition to cruise operations. The EP's control box is connected to the GCS to accomplish these functions and would only be involved with TCS concerning those tasks that are required to hand-off the AV from the EP system to TCS.

3.1.2 Outrider

The current Outrider Training course is seven weeks and includes system description, maintenance functions, operator functions and emplacement / displacement. There are three weeks of classroom instruction and four weeks of practical instruction. The prerequisite for this course is to be a certified Operator on either Hunter or Pioneer systems. The training consists of the following courses:

- System Overview
- Ground System Description
- Air Vehicle
- Embarkation / Debarkation
- Organization Level Maintenance
- Emergency Procedures
- Safety Precautions
- System Performance Evaluation

All students are qualified as the Air Vehicle Operator (AVO), Mission Payload Operator (MPO), and Organizational Level Maintainer. Outrider training is currently conducted by the contractor but will transition to the Joint UAV Training Center at Ft. Huachuca, AZ, during LRIP. Once this transition is made, the course will be expanded to allow entry-level students. It will also be augmented to include Intermediate Level Maintenance training.

3.1.3 Predator

Predator Operator Training is administered by the 11th RS as separate Air Vehicle Operator (AVO) and Sensor Operator (SO) syllabi. The courses are composed of the following:

- Sensor Operator
  - Sensor Operator classroom (30.5 hours)
    - Systems
    - Crew Coordination and Target Acquisition
    - Data Exploitation and Mission Planning
    - Synthetic Aperture Radar
  - Sensor Device Training (24 hours)
  - Flight Training (11 flights/32 hours)
- Air Vehicle Operator
  - Air Vehicle Operator classroom (22 hours)
    - Systems
    - Menus
    - Datalink
    - Limitations
    - Crew Procedures
  - Air Vehicle Device Training (24 hours)
  - Flight Training (13 flights/26 hours)

Predator also does not utilize an EP. Each of the syllabi has distinct ground and flight training phases. The ground training courses for both syllabi are very similar in content. They both teach basic functions, menus, displays, and operation of the various parts of the Predator system - Air Vehicle, Payload, Ground Control Station, and Ground Data Terminal. Differences between the two courses are in emphasis and detail based on crew position. AVOs are introduced to SO displays and functions particularly as they may apply to AV control but training time is not used to learn actual manipulation of the sensor systems. The majority of training time is focused on AV control function and operation. The reverse is true for the SO syllabus. At the end of IQT training, personnel are qualified as either an AVO or PO. Operational unit certification through Mission Qualification Training (MQT) remains the same as the other services.

3.2 TCS Integration into the Training Continuum

3.2.2 Training Category

3.2.2.1 UAV Service/System Specific Institutional Training

3.2.2.1.1 TCS Core IQT Training

For Pioneer, Predator, and Outrider UAV system/service specific training the Core course will be integrated into the academic lessons of the existing IQT/ Replacement Operator course(s) of instruction. For example, in Pioneer training, the TCS Core course CBT and formal training modules will be integrated into the Crew Coordination, Ground Control Station, Air Vehicle and

Payload operation academic training as well as Mission Planning. This will develop knowledge of basic TCS system operation and function. In the Predator syllabi, the Core course will be integrated into the systems portions of ground training courses for the AVO and SO. For both programs the development of operational skills, through hands-on exposure to TCS, will be gained with the use of TCS as the UAV control system during device/simulator and flight phases of training. At the successful completion of Replacement Operator Training, Pioneer Ground Control Station Operators will be TCS Levels 1-4, single-UAV qualified, since the IP does not control the AV during takeoff and landing. Outrider Operators would be levels 1-5, single-UAV qualified. Predator AVOs would be levels 1-5 single-UAV qualified. SOs would be levels 1-3 single-UAV qualified. Currency/recurrency requirements would remain the same as currently exist for each UAV type.

3.2.2.1.2 TCS Follow-on Advanced Training

Following selection by their service's, TCS single-UAV qualified operators would return to the institutional training base for a follow-on Advanced Course structured to qualify operators for TCS Levels 3-5, multi-UAV operations.

Qualification and currency/recurrency criteria for TCS levels 3-5, multi-UAV operations will need to be defined by the individual services and incorporated into the ISD of the Advanced Training program.

3.2.2.2 Non-UAV Personnel Training

Personnel who do not have UAV MOS/NEC/AFSC's or have not been qualified through service/specific UAV training (shipboard personnel, staff, other field personnel), would receive a tailored version of the TCS Core course, as In-service "just in time" Training in the field (para 3.3.3). The course would qualify personnel for TCS Interactivity Levels 1-2. No currency/recurrency training requirements are anticipated.

TRAINING	TCS LEVEL OF QUALIFICATION
1. UAV-SPECIFIC (PIONEER, PREDATOR, OUTRIDER)	
• INSTITUTIONAL BASE TRAINING	
• SERVICE/SYSTEM IQT (TCS CORE COURSE INTEGRATION) • PIONEER (IP/PO) • OUTRIDER (AVO/PO) • PREDATOR • AVO • SO	 LEVEL 1-4 SINGLE-UAV LEVEL 1-5 SINGLE-UAV LEVEL 1-5 SINGLE-UAV LEVEL 1-3 SINGLE-UAV
• TCS ADVANCED COURSE	LEVEL 3-5 MULTI-UAV
2. NON-UAV PERSONNEL (SHIP'S COMPANY, STAFF, OTHER FIELD PERSONNEL)	
• IN-SERVICE TRAINING	
• TAILORED CORE COURSE	LEVEL 1-2

Table 3: TCS TRAINING MATRIX

3.3 Implementation Strategy

3.3.1 Initial Fielding/New Equipment Training

The strategy for New Equipment training will be to institute the following Top-Down Implementation Program:
(1) Develop an initial cadre of SMEs/Instructional developers/Operators that are an integral part of the engineering and ISD process. The Cadre will be composed of both contract and government personnel. In their capacity as training developers, and instructors, Initial Cadre personnel will be under the direction of the TCS Training Integrated Product Team (IPT)

(2) Develop the TCS Core and Advanced courses using initial Cadre personnel.

(3) Train individual service Curriculum Developers using LRIP systems and Cadre personnel as Instructors. The service teams would be provided and supported by the training institutions involved. Depending on the Sustainment Training Concept (para. 3.3.2) training could involve a team from each training institution or a single joint team.

(4) Form a Process Action Team (PAT) from initial Cadre and trained service curriculum developers to integrate the TCS Core course into service/system unique training programs.

(5) Conduct Instructor and key personnel training, at institutional training site(s) and in the field. Initial training would be the responsibility of the IPT, phasing out as service training institutions gain a standalone capability.

(6) If required, the IPT will support initial fielded systems until services have trained personnel to meet manning requirements.

□7□Conduct initial Instructor and key personnel Advanced Course Training for personnel designated by the services.

Figure 2: IMPLEMENTATION STRATEGY

3.3.2 Sustainment Training

The following are options for sustainment training:

(1) **<u>Option 1</u> - Single-site TCS Institutional Training**.

Because TCS has a standardized HCI, basic TCS operation, menus, displays, buttons, etc. are the same regardless of UAV type. The TCS Core course could be taught at a single-site as a common course for all UAVs that use the TCS as their controlling system, prior to attending their system/service specific training.

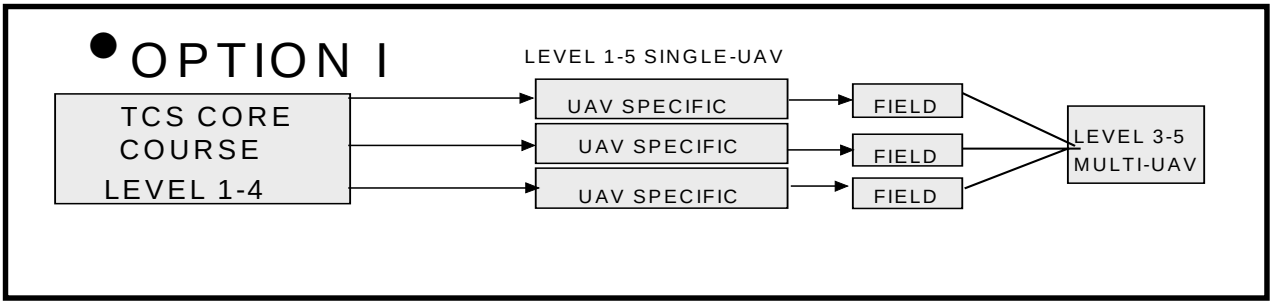
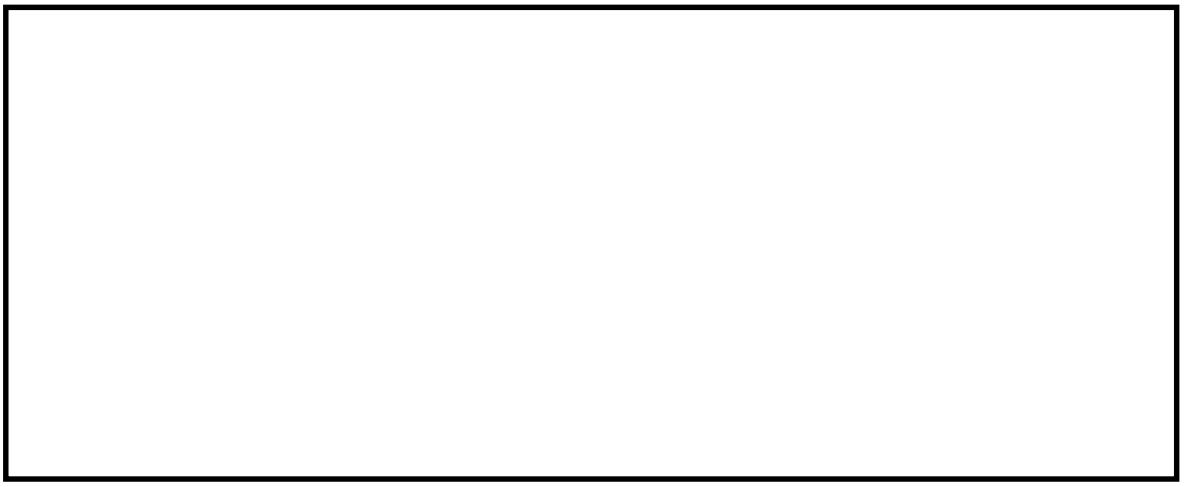


Figure 3: OPTION I TRAINING CONCEPT

(2) **<u>Option 2</u> - Individual system/service specific Training Programs**

The TCS Core course would be integrated into each system/service specific UAV systems ground training. Each course would be conducted independently.



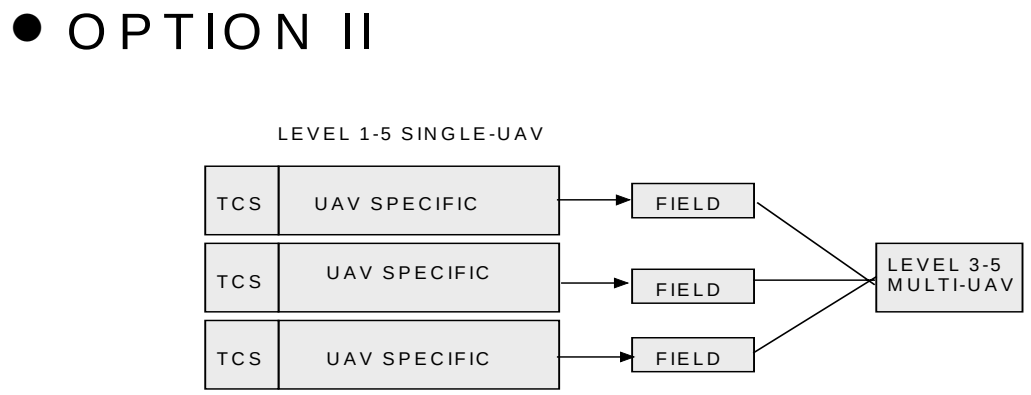


Figure 4: OPTION II TRAINING CONCEPT

(3) **<u>Option 3</u> - Conduct the TCS Core course as a "common course" for Ft. Huachuca, AZ based UAV systems and integrate it into U.S. Air Force Predator syllabi.**

Use the TCS Core as a common course for the programs supported by NAMTRAGRUDET and JUAVTC. This concept is aligned with the current proposal when Pioneer phases out in 2002/3 and the Navy, Army and Marine Corps have a common tactical UAV.

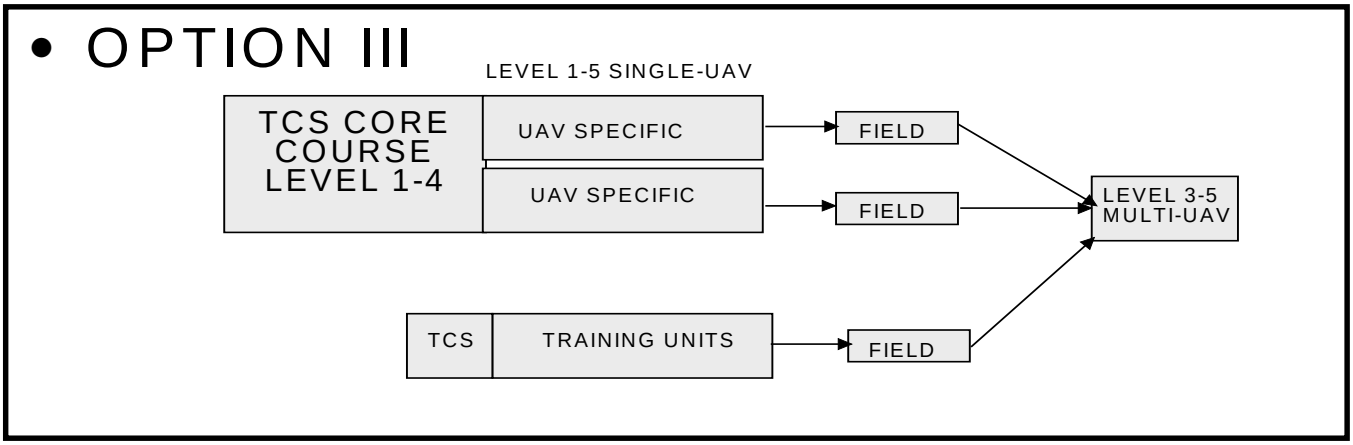


Figure 5: OPTION III TRAINING CONCEPT

3.3.3 In-Service Training

The Training Concept will utilize an In-Service Training (IST) capability to conduct training in the field, using technology as the vehicle. The requirement is to provide TCS level 1-2 training to non-UAV units as well as the capability to update and train personnel in the field to software and engineering changes for TCS and/or specific UAVs. This IST will be scaleable to meet the level of Interaction prescribed by the TCS configuration onboard the receiving unit.

4.0 TRAINING DEVELOPMENT CONCEPT

4.1 Training Development Overview

TCS training will be an interactive training package that will provide information and training on the operation and maintenance of the TCS in a range of operational scenarios. It will consist of a set of computer-based training (CBT) materials consisting of self-paced ICW and on-line training resources embedded in the TCS Human-Computer Interface (HCI), Computer Assisted Instruction (CAI), formal lecture and discussion, and the use of simulation to develop and maintain knowledge and skills. The training will be supported by a Computer Managed Instruction system to provide both on-line and off-line capability for testing and tracking user proficiency.

Training will be aimed at satisfying the requirements of the wide variety of user skill and knowledge levels that TCS will need to address.

The entire training capability from both the stand point of syllabus construction and software design will support integration into an Electronic Classroom and Learning Resource Center (ERC/LRC) depending on individual service and fiscal requirements.

4.2 Training Development Goal

The primary goal of Training Development is to work with the institutional training programs to ensure:

- TCS training is designed and established to preclude duplication of material and training efforts.
- The TCS Courses of Instruction provide technologically advanced training.
- TCS training is appropriately melded into the institutional programs to accomplish a "one system" approach rather than independent courses competing for the same resources.
- IST capability exists to extend training to the field using technology as the vehicle.
- Optimum use of existing and planned hardware, communications and software improvements being effected by various civilian and military organizations.

4.3 Training Development Objectives

- Apply a systems approach to develop a TCS Training Program that will provide operator and maintenance personnel with the necessary knowledge and skills to support the TCS system. This will include: individual and crew training; new equipment training; initial, formal, and on-the-job training. The program will cover all TCS Levels of Interaction.

- Execute the analysis, design, and development elements of the Instructional System

Development (ISD) process to accommodate an easy and cost-effective transition to service specific UAV training programs.

- Develop the TCS Training Program in modules such that training available is scaleable to the level of interaction achievable by the particular TCS configuration.

- Support the development strategy of the TCS program with a training development approach that will accommodate modification and/or development of plans and courseware to support increases in TCS functionality and capability.

- Provide TCS training to support the TCS Training Continuum. Training will include the processes, procedures, techniques, training devices and equipment to train civilian, active duty and reserve personnel to operate and support the TCS system.

4.4 Training Development Strategy

A build-incremental update approach will be used for the development of the overall TCS Training Program. This approach will support risk reduction and training program definition. Because instructional development is in parallel with engineering development, this incremental update strategy will allow for periodic review and updating to reflect changes in system design, student and instructor evaluation, and operational lessons learned. The initial prototype ICW will be built to support Engineering Build 3 and be incrementally updated to support succeeding Engineering Builds. Development of "prototype" ICW and instructional material will lag TCS system development in order to let each of the planned software/engineering builds of the TCS system reach a level of stability upon which effective instruction can be built.

4.4.1 Development Considerations

(1) Development of paper-based training - A requirement exists to have the capability to train personnel who support the operation of TCS for various Tests and Demonstrations. The Training IPT is currently supporting those efforts using paper-based training products. The development and update of the paper-based training program will continue throughout Phase I. During this timeframe ICW will be in development and will be phased into the paper-based program as it is developed and validated. The eventual mix of Formal and Interactive courseware that is validated at the end of Phase I will become the TCS Core Course.

(2) Stability of design - The TCS HCI defines TCS functionality and is composed of a large number of elements and groupings of elements. As development progresses portions of the HCI representing various functional areas of the TCS system will become stable while others remain in development. Working in conjunction with the HCI team, it will be possible to identify stable elements and incorporate them into the ISD work in progress instead of waiting for the entire HCI process to complete. Training development can then keep pace with software development.

(2) Stability of elements "inside" or "outside" the HCI - Training software development will require two separate authoring/scripting processes. One process will be used for functions that are "inside" the HCI where the TCS program has control of the code, and programming within the various functional programs can be established that allow for ease of access and more

interactivity. For those DII COE programs and/or COTS programs that remain "outside" the HCI the code is not accessible and a different scripting process is required for training program development. To keep from developing a program twice, development will only be done as a system function is stable either in or out of the HCI.

To maintain the flexibility required for emerging hardware and software development but still retain the capability to produce a defined production schedule the Training IPT will designate a set of functions for which ICW will be developed for each of the ICW builds and updates. This will be accomplished prior to beginning the production of the Instructional Media Package that supports that increment. This flexible approach will allow for the changing nature of hardware and software engineering development without disrupting ICW development schedules and to deliver ICW that supports the stable elements of the targeted Engineering Build.

The combination of ISD material and ICW available at the beginning of Phase II will provide the stable package required to smoothly accomplish the implementation of the Top-Down approach to initial introduction, conduct the training of service Training Development Teams and begin the process of integrating TCS training into service/system specific training to meet IOC deadlines.

4.5 Plan of Action and Milestones

Training Development will be accomplished in the following increments:

(1) INCREMENT 1: PRELIMINARY COURSEWARE DEVELOPMENT. The objective of Increment 1 is to accomplish overall TCS Program Manpower, Personnel and Training Instructional System Development analysis and requirements studies. Accomplish ISD to define the software design and interface standards and develop an initial "prototype" ICW training program to support EB3. The prototype ICW will be developed for a set of functions, approved by the Training IPT, both "inside" and "outside" the TCS interface, for which development and design are stable enough to support the effort. Increment 1 will include the following elements:

- MPT Analysis.
  - Training Device Requirements Analysis
  - Media Analysis
  - Facilities Requirements Analysis

- Initial development of the following Instructional Systems Development (ISD) "building block" products (see para 5.3 for detailed description) to a level to support EB3 functionality.
  - Training Development and Management Report
  - Training Task Analysis (MCIO)
  - Learning Analysis Report (LAR)
  - Instructional Media Package
  - Instructional Media Data Files
  - Training System Utilization Handbook

- The production, test, and integration of a prototype ICW TCS training program supporting those functional elements of EB3 approved by the Training IPT.

- Conduct a "small audience" tryout to validate this first increment of training.

(2) INCREMENT 2: UPDATE CYCLE. The objectives of Increment 2 will be the update of Increment 1 ISD to match the increases in TCS capability in EB4, as well as incorporation of improvements identified by validation and initial demonstration lessons learned. The Increment 1 ICW program will be updated to add the additional capabilities of EB4. The following elements will be completed:

- ISD will include update of Increment 1 material and development of the following:
  - Lesson Specification Report
  - Test Package

(3) INCREMENT 3: FINAL COURSEWARE DEVELOPMENT. Increment 3 ISD will be done in two phases:

- Phase I- Complete the ICW to match the capability of the EB5 systems as well as any additional instructional courseware required to deliver the TCS Core Course and accomplish the New Equipment training to the service Training Development teams.

- Phase II-Update the ICW and Core Course material to match capabilities of LRIP systems and, when training requirements have been identified, complete CBT and formal instructional courseware.

Charts 4.5-1-4 delineate a development and delivery schedule for the training products for each of the increments. The end date listed in the charts is for delivery of the "draft" product for review and approval by the Training IPT prior to submission to the Program Manager.

(1) Increment 1 - Initial Development

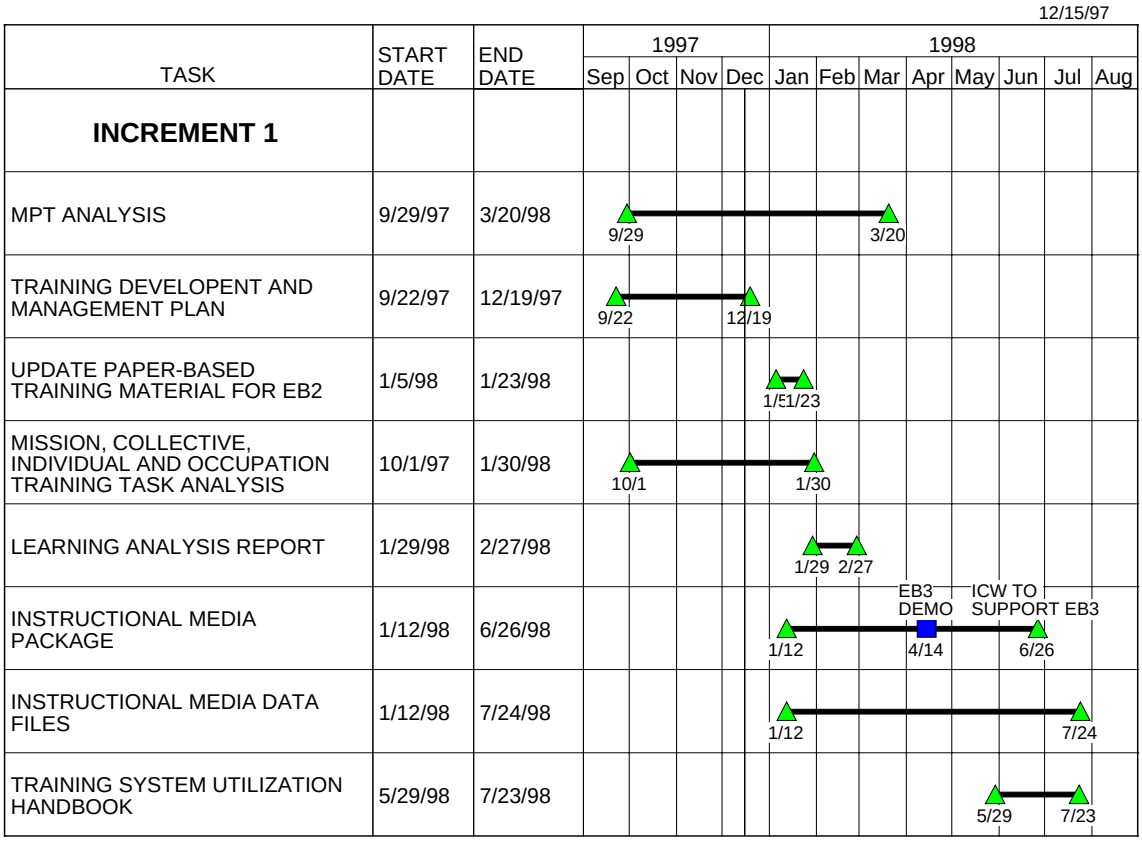


Chart 1: INCREMENT 1 - INITIAL DEVELOPMENT

(2) Increment 2 - Update Cycle

12/15/97

TASK	START DATE	END DATE	1998 Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
INCREMENT 2											
UPDATE MCIO	5/15/98	6/19/98			5/15	6/19					
UPDATE LAR¸	6/12/98	7/12/98				6/12	7/12				
UPDATE PAPER-BASED TRAINING MATERIAL	7/3/98	8/1/98					7/3	8/1			
UPDATE MEDIA PACKAGE	4/17/98	10/2/98		4/17				DEMO EB4 8/14	ICW TO SUPPORT EB4	10/2	
UPDATE MEDIA DATA FILES	7/6/98	10/11/98					7/6			10/11	
UPDATE SYSTEM UTILIZATION HANDBOOK	8/14/98	10/11/98						8/14		10/11	
LESSON SPECIFICATION REPORT	7/3/98	10/10/98					7/3			10/10	
TEST PACKAGE	6/22/98	10/31/98				6/22					10/31

Chart 2: INCREMENT 2 - UPDATE CYCLE

(3) Increment 3 - Final Development (Phase 1 and 2)

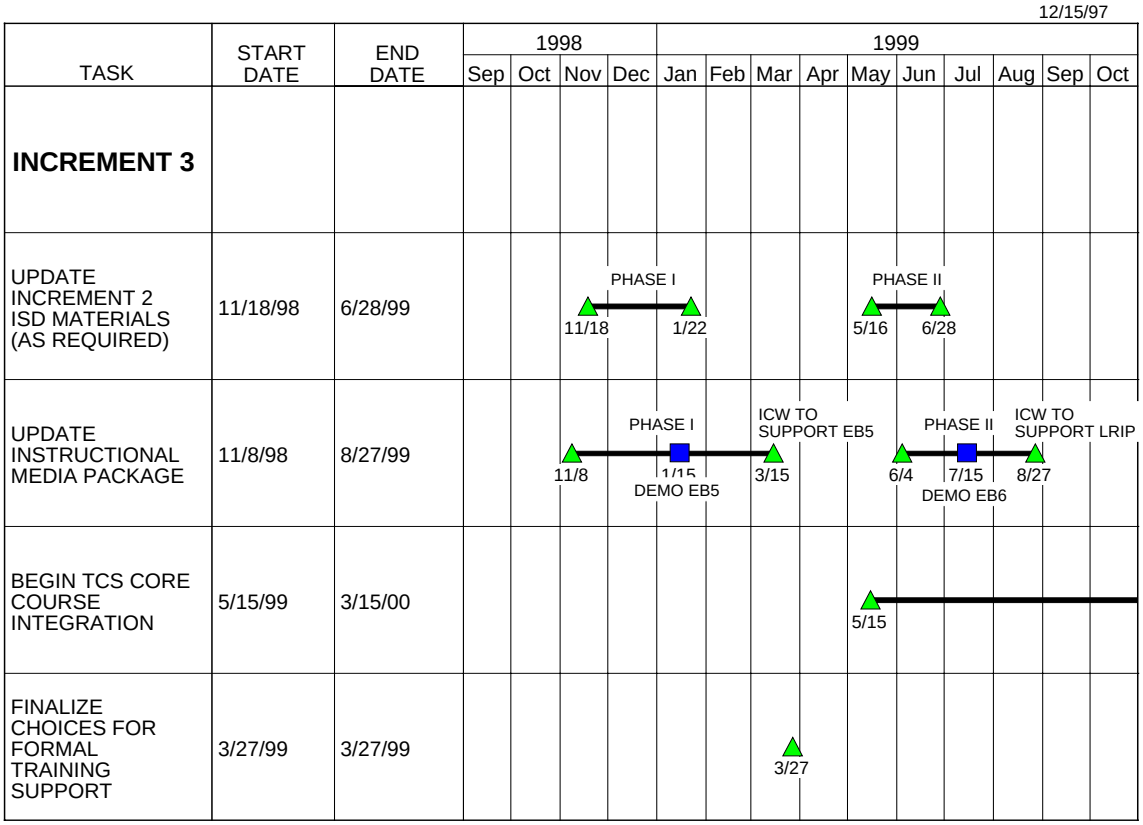


Chart 3: FINAL DEVELOPMENT

Table 4 delineates the EB demonstration dates with the demonstration dates for the ICW that support each EB.

TCS DEVELOPMENT	DATE	TRAINING DEVELOPMENT INCREMENT	DATE
Engineering Build 3	4/98	INC. 1 - Initial Build	6/98
Engineering Build 4	8/98	INC. 2 - Update Cycle	10/98
Engineering Build 5	1/99	INC. 3 - Final - Phase 1	3/99
		Begin Core Course Integration	5/99
Engineering Build 5 Final	7/99	INC. 3 - Final - Phase 2	8/99

Table 4: ENGINEERING BUILDS VS. TRAINING DEVELOPMENT INCREMENTS

4.6 Subject Matter Experts/Cadre

Achieving the goals of the training development program will require the use of a core group of trained Subject Matter Experts. This core group will be composed of contractor and government operators, technicians, and educational specialists. The group will assist in TCS system development, be available as operators for the initial demonstration phases, develop the training materials, and provide follow-on training for personnel who will be become the initial Instructors and Operational Personnel for the operating service.

5.0 INSTRUCTIONAL SYSTEMS DEVELOPMENT (ISD) PROCESS

5.1 ISD Phases

The Training IPT will use a systematic approach to develop the training program and training materials. This approach will integrate the processes of analysis, design, development, implementation, and evaluation.

(1) Analysis. An analysis of the mission and job will be accomplished to determine the specific inventory of tasks, knowledge and skills required to perform the job and to identify those that require training. This will involve determining the skills of all personnel required to support the performance requirements. Quantitative and qualitative personnel and training requirements will be identified by recording and analyzing task frequencies, learning difficulty, delay tolerance, probability of inadequate performance, and other factors.
(2) Design. The training design will be based upon analysis results. Design will include converting tasks into learning objectives, sequencing training, preparing course outlines, defining media design requirements, planning for trainee evaluation, constructing written performance tests, and identifying resource requirements.

(3) Development. Training development will be based on the design. It will include developing lesson plans, trainee materials, media, and other training materials. Review of developed materials for technical and doctrinal accuracy will occur throughout this phase with validation of the developed materials as the final step.

(4) Implementation. The conduct and management of the validated and approved training program will accomplish implementation.

(5) Evaluation. Evaluation of the training will be conducted for accuracy and effectiveness over the life cycle of the program. Feedback from the evaluation process will be used to modify the training program as necessary.

5.2 Format

The "bedrock" training program documents will be prepared using MIL-PRF 29612 and the older MIL-STD 1379 as a guide, following the pattern established by the Outrider program. Since all other existing UAV Training Programs were developed under MIL-STD 1379, TCS training products will use a mix of formats relying primarily on MIL-STD 1379 for format guidance. The object is to develop the training materials in the format most compatible with existing service training documentation for an easy and cost-effective transition in the future. The Training IPT is fully aware of the MIL-STD 1379D Conversion Program and the new requirements of MIL-PRF 29612. Training Developers are currently reviewing the Data Item Descriptions that support the new performance standard and will make recommendations to the Training IPT where the best fit exists and revisions and/or changes should be made.

5.3 Task and Data Item Descriptions

The following are deliverable ISD products (Data Item Descriptions (DIDs)) that will support the Training Program

(1) Planning

Training Program Development and Management Plan (DI-ILLSS-81070)

Describes the ISD activities to be performed during the analysis, design, development, and implementation of the training system. The principle use is to provide NSWC DD a basis for evaluating the effectiveness of applying the ISD process over the life cycle of the training system.

The report contains:

- Technical approach
- Program management
- Program constraints and assumptions
- Milestones
- Organization and staffing

- Coordination and communication
- Acquisition and utilization of resources
- Training of personnel
- Special planning considerations
  - Configuration control
  - Media Conventions
  - Integration and Testing Plans

(2) Analysis

Mission, Collective, Individual, and Occupational Training Task Analysis (MCIO) (DI-ILSS-81078)

Identifies the tasks that will be trained, under what conditions they will be taught, and the standard of performance that must be achieved. The tasks analysis will be done in three parts:

Mission analysis- a process to provide basic data on system functions, types of equipment, maintenance requirements. It will review mission requirements developing collective task statements and arranging the collective tasks in a hierarchical order.

Job Task analysis - a process of examining a specific job to identify all the duties and tasks performed at a given skill level. A Job Task List (JTL) is produced. Development of the JTL is the first step in determining what knowledge and skills are necessary for job performance and, therefore, considered for training. Not all JTL tasks are selected for training. Development of the JTL will take full advantage of existing task analyses for Predator, Outrider, other applicable UAVs, and the Operational and Logistics Task Analyses for TCS.

Training Requirements Analysis (TRA). The TRA will develop the Training Task List (TTL). Each JTL task will be analyzed based on target population and a set of established criteria to determine which skills will be trained and in what settings. The TTL will ensure that instruction will be provided for those tasks only, and resources will not be wasted teaching tasks which can be accomplished without training.

The MCIO will contain the following items:

- Mission objective
- Mission scenario
- Mission segments
- Master task listing
- Finalize procedure for defining training requirements
- Identify target population (potential students)
- Determine student experience level
- Identify students' current proficiency and qualifications
- Assess potential sources of students
- Assess students' knowledge and education

- Create final training task hierarchy list
- Define increase needed in skills, knowledge and attitudes
- Define performance factors and qualification levels for terminal objectives
- Document in a database, tracing requirements back to mission description
- Assess life cycle training and support impact

Learning Analysis Report (DI-ILSS-81083)

Provides listings of skills, knowledge, and learning objectives, and sequencing of those objectives for the tasks that have been selected for training.

Objective Analysis - training objectives are the framework in which training systems are designed and developed. The objectives are directed at meeting all training requirements. The achievement of the training objectives makes up the difference in knowledge, skills and attitudes needed by the target population to do the job. The purpose of conducting objective analysis is to clearly stated training requirements in terms of conditions, standards, and behaviors, and arrange them in a logical and effective sequence. This becomes very important when structuring the course syllabus and developing the courseware.

The objectives analysis will complete the following tasks:

- Develop objectives
- Translate training requirements into objectives for each qualification level reflecting behavior, conditions, and standards
- Document objectives hierarchy
- Using a database trace objectives back to mission description
- Sort/organize objectives into a hierarchy for each crew position
- Create a flow chart for relationships
- Describe qualification levels

(3) Design/development

Preliminary Syllabus
Develops and documents a detailed outline of the overall structure of the instruction. The preliminary syllabus will provide a master plan that describes how the training system configuration and overall training concept will be used.

The preliminary syllabus will accomplish the following tasks:

- Cluster/sequence objectives
- Define course structure
- Define course times
- Develop course maps
- Trace syllabus elements back to mission description
- Indicate facility needs

Lesson Specification Report (LSR) (DI-ILSS-81090)

Describes the instructional strategies, subject matter content, instructional materials formats, and other guidance for authoring and producing the training materials for each lesson. It will guide the design of Lesson Plans and the Trainee Orientation Guides.

The LSR will accomplish the following tasks:

- Description of lesson strategies
- Lesson strategy organization and format
- Learning objectives
- Unit and lesson maps
- Lesson design strategy
- Lesson format guide
- Prototype lesson
- Resource requirements

Instructional Media Package (DI-ILSS-81092)

Provides instructional media and the supporting data used in the production of the curriculum materials. This package will include instructional media, scripts, storyboards, and graphic programming requirements.

Instructional Media Data Files (DI-ILSS-81093)

Documents the design, development, programming data, and adjunctive materials required to maintain instructional media and provide NSWC DD life cycle support for the training system.

Lesson Plans (DI-ILSS-81095)

Outlines the learning objectives, presentation techniques, media, and equipment for each lesson in the syllabus. It is used to guide the instructor or to control the direction of machine implemented instructional material.

Trainee Orientation Guide (DI-ILSS-81102)

Provides information necessary to describe a new training system. It is a detailed written guide that provides the background, scheduling, and study materials to be used by the student. It is used to orient the student to the training system and to aid the student in the acquisition of skills and knowledge required in a course of instruction.

Test Package (DI-ILSS-81085)

Provides an evaluation or measurement of an individual's or unit's achievement of learning objectives or performance standards.

The Test Package will contain:

- General test requirements
- Types of test items
- Test booklets
- Test instructions
- Job task sheets
- Administrators Guide
- Test item cross-reference chart
- Scoring templates

Training System Utilization Handbook (DI-ILSS-81096)

Provides Trainees with information to aid them in operating and achieving full utilization of a training system during the presentation of a COI, training exercise or mission.

The Handbook will contain:

- Description of the training system
- Training system Operating Procedures
- Learning Objectives
- Reference and Text Materials
- Training syllabus
- Training exercises
- Training system Administrators Guide
- Training system User's Guide

(4) Implementation

Course Completion Report (DI-ILSS-81104)

Provides a summarization of completed course objectives; number of students trained and number failing to successfully complete the course including the reasons therefor. The report will include a course critique, which validates instructional material and test results.

Training Evaluation and Validation Report (DI-ILSS-81105)
Provides information collected during the evaluation of training. It includes observations on training effectiveness, materials, test items, etc. and reports deficiencies, problems, and recommendations for course improvements.

Table 2 matches each major training task and supporting subtask with the applicable Data Item Description.

TRAINING TASK/SUBTASK	DATA ITEM DESCRIPTIONS
1. Develop a training plan for TCS-controlled UAV's	1. Joint Training System Plan 2. Training Program Development and Management Plan

2. Conduct Manpower, Personnel, and Training requirements analysis for long range planning.	2. MPT Analysis • Training Device Requirements Analysis • Facility Requirements Analysis • Media Analysis • Training Alternatives Analysis
3. Develop a curriculum plan	3. Preliminary syllabus
• Develop Training system requirements • Develop Training Objectives, sequence objectives to develop learning hierarchy	• Mission, Collective, Individual, and Occupational Training Task analysis • Learning Analysis Report
4. Modify existing courseware and develop new course material as appropriate to implement the training and curriculum plan • Develop learning strategies, lesson content, lesson development formats • Develop Test items • Develop Instructor guidance • Develop Student guidance	• Lesson Specification Report • Test Package • Lesson Plans • Trainee Orientation Guide
5. Design, develop, code and unit test the training software to integrate into the TCS core software • Develop lesson specifications • Develop abstract of training • ICW design strategies • ICW test strategy • Flow diagrams • ICW Script-Storyboard	5. Media Package
6. Support integration, test, and demonstration of the training software into TCS software	6. Training System Development and Management Plan • Media Package • Training System Utilization Handbook • Training Evaluation and Validation Report
7. Prepare a schedule and roadmap defining incremental development and integration of the training software into TCS.	7. Training Program Development and Management Report
8. Provide training using the approved courseware to support the TCS program plan	8. Course Completion Report

Table 5: TRAINING TASK vs. DATA ITEMS

5.4 Tailoring Task Descriptions

A major planning function is the accurate identification of the data or information that is required to fulfill each training requirement. Intelligent and accurate tailoring of the DIDs will avoid unnecessary escalation of costs through the performance of tasks or the purchase of data that either extends significantly beyond the minimum scope of the original training requirement or that does not meet the needs of the end user. Proper tailoring of requirements is vital to a sound, cost effective, and supportable training program. Appendix A details the tailoring of each DID to support an optimal balance between operational need and cost.

6.0 PROGRAM MANAGEMENT

6.1 Interface with the TCS IPT Process

A government and industry team is accomplishing TCS Training Development. An Integrated Product Team (IPT) organization is established to address TCS training and fielding requirements. The Training Development project is integrated into the TCS IPT process through the Training IPT (Figure 6). The Training IPT is Chaired by Mr. C. Moore (Battlespace, Inc. TCS Training Development Program Manager). The Training IPT organization, authority and responsibilities are defined by a charter approved by the TCS Program Manager. While the Training IPT reports directly to the TCS Program Manager, it enjoys a special coordinating relationship with the Logistics IPT since training is a sub-set of the Integrated Logistics Support Plan. Both IPTs depend heavily on the exchange of analyses and products in their respective development efforts.

All preliminary and final Training Development materials will be submitted to the Training IPT for review and approval prior to submission to the Program Manager. The IPT will ensure they meet DoD requirements using MIL-STD-1379D and MIL-PRF-29612, as a guide and include all tasks required to support the operation and maintenance concepts.

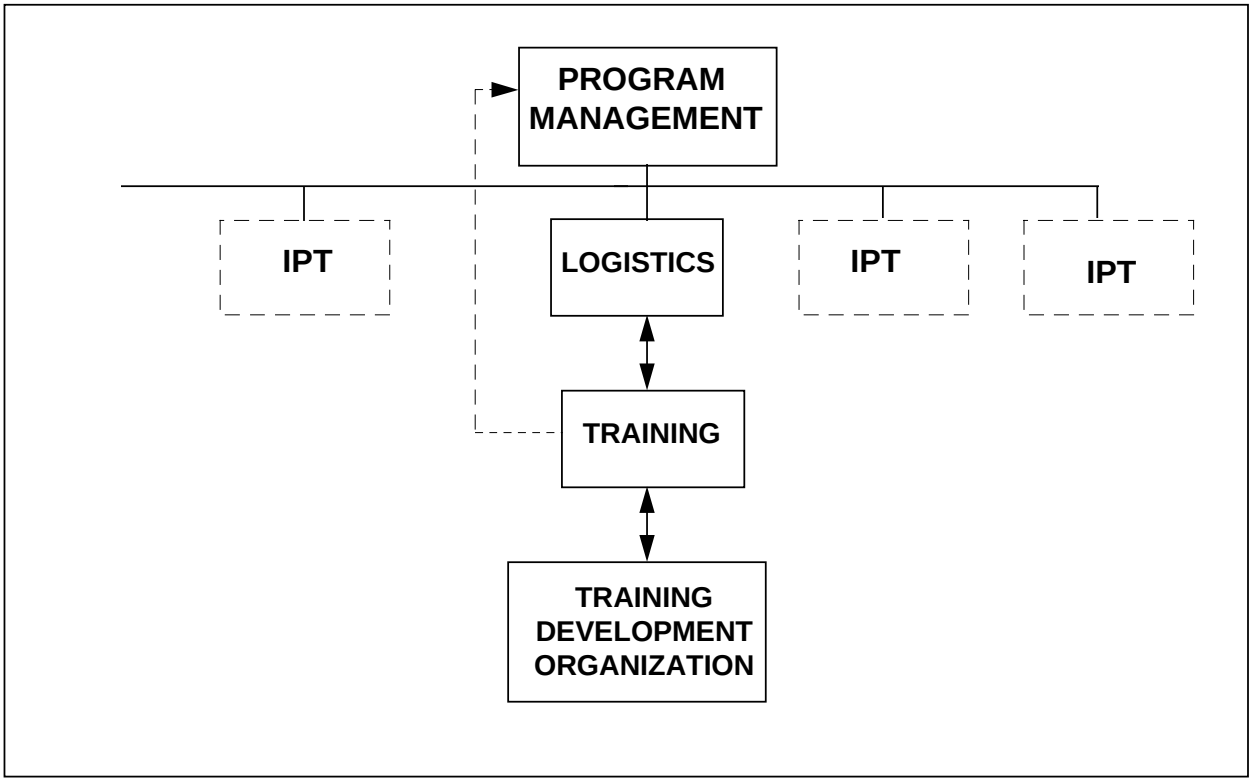


Figure 6: TRAINING DEVELOPMENT INTERFACE WITH THE IPT PROCESS

6.4 Communication

TCS training development tasks will be performed at sites in Washington, DC; Patuxent River, Maryland; Dahlgren, Virginia and at various test and demonstration locations. Tasks will also be performed at institutional training facilities in Indian Springs, Nevada and Ft. Huachuca, Arizona.

The Training Development project gains the benefits of timeliness and accuracy of information by having personnel located at system production, operations, and program management sites that are familiar with the project and its requirements.

The Project Management system is based on a reliable multi-path high speed electronic linking system for both voice and data. All the principle Training IPT members both government and contractor as well as subcontractors associated with the Training Development project are connected by modem and email. All personnel performing direct labor are connected through electronic mail systems.

The Training IPT, and its Training Development organizations are in contact and will interact closely with the other TCS IPTs to ensure TCS goals and requirements are met.

Team members with a requirement for direct access for interconnection to NSWCDD will be

permitted access only after accreditation by the cognizant NSWCDD Designated Approving Authority.

6.5 Configuration Management

All Training Development materials and suppliers will comply with the TCS Configuration Management Program.

6.6 Quality Assurance

All Training Development providers have internal Quality Assurance/Control Procedures in place that have been approved by the government. Training product suppliers will comply with government requirements for acceptance of training products. Once accepted by the government the TCS Program QC standards and procedures will apply. Additionally, the IPT process provides for internal review and revision prior to any material being forwarded to the Program Manager.